OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **ISLAND POND, STODDARD** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *slightly declining* in-lake chlorophyll-a trend since 1997, meaning concentrations have increased. This summer's average concentration was above the state mean and was the highest the pond has ever experienced. Algal concentrations in August were indicative of an algae bloom. The golden-brown alga *Chrysosphaerella* was dominant at that time. We hope to see chlorophyll concentrations return to a healthy level next season. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *stable, but declining,* trend in lake transparency. Water clarity in August was low due to the excess amount of algae in the water. The mean transparency has decreased since 1997 and remains below the state mean. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is

the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show an *improving* trend for in-lake phosphorus levels, which means levels are decreasing. Hypolimnetic phosphorus concentrations improved again this season, and it is the sixth straight year mean phosphorus concentrations have decreased in the hypolimnion. The mean phosphorus concentration in both layers remains below the state median. August results were significantly lower than in July. Phosphorus concentrations in late July likely caused the algae bloom in the lake. The monitors noted that there had been continuous rain for a period, which likely caused the increase in phosphorus from watershed runoff. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- **Please note** on August 21st this summer the epilimnetic, hypolimnetic, and Inlet phosphorus levels were found to be less than 5 µg/L. The NHDES Laboratory Services adopted a new method of analyzing total phosphorus this year and the lowest value that can be recorded is 'less than 5 µg/L'. If this caused an increase in the average phosphorus for either of the layers we would like to remind the association that a reading of 5 µg/L is still considered low for New Hampshire's waters.

- Overall, conductivity decreased for Island Pond this season (Table 6) compared with the slight increase due to the dry weather in 1999. The increase in rain helped to keep the flushing rate of the pond at a normal level for the pond. We hope to see a continuation of this trend next season.

- Dissolved oxygen was again high at all depths of the lake (Table 9). As stratified lakes age, oxygen is depleted in the lower layer by the process of decomposition. The lack of this aging indicator is a sign of the lake's overall health.

- Island Pond did not have a return of blue-green algae this season. However, there was a bloom of the golden-brown alga *Chrysosphaerella* in August. Golden-browns are usually dominant in the spring and fall in most lakes. They typically are non-nuisance algae however when in abundance they tend to produce a fishy odor. Noting odor, color, and clarity of the water on the field data sheet is helpful when monitoring the pond.

NOTES

- Monitor's Note (7/31/00): Continual rainfall for the last 24 hours.

USEFUL RESOURCES

A Boater's Guide to Cleaner Water, NHDES pamphlet, (603) 271-3503 or www.state.nh.us

Freshwater Wetlands: A Guide to Common Indicator Plants of the Northeast. By Dennis Magee, Univ. of Massachusetts Press, 1981. (413) 545-0111, or www.umass.edu/umext/bookstore.html

Road Salt and Water Quality, WD-WSQB-7, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Native or Naturalized Shoreland Plantings for New Hampshire. NHDES Shoreland Protection Program. (603) 271-3503

Phosphorus in Lakes, WD-BB-20, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Clean Water in Your Watershed. Terrene Institute, 1993. (800) 726-5253, or www.terrene.org

Vegetated Phosphorus Buffer Strips, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

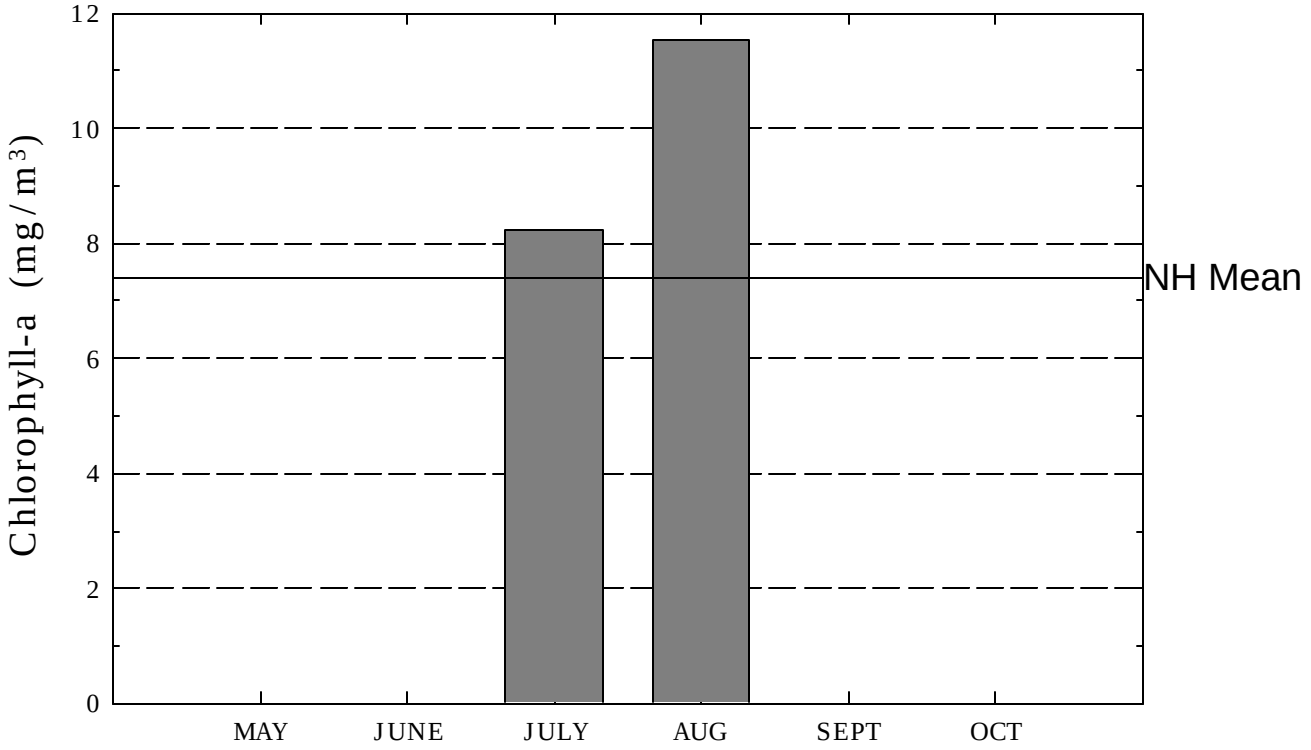
Lake Protection Tips: Some Do's and Don'ts for Maintaining Healthy Lakes, WD-BB-9, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Comprehensive Shoreland Protection Act, RSA 483-B, WD-BB-35, NHDES Fact Sheet. (603) 271-3503 or www.state.nh.us

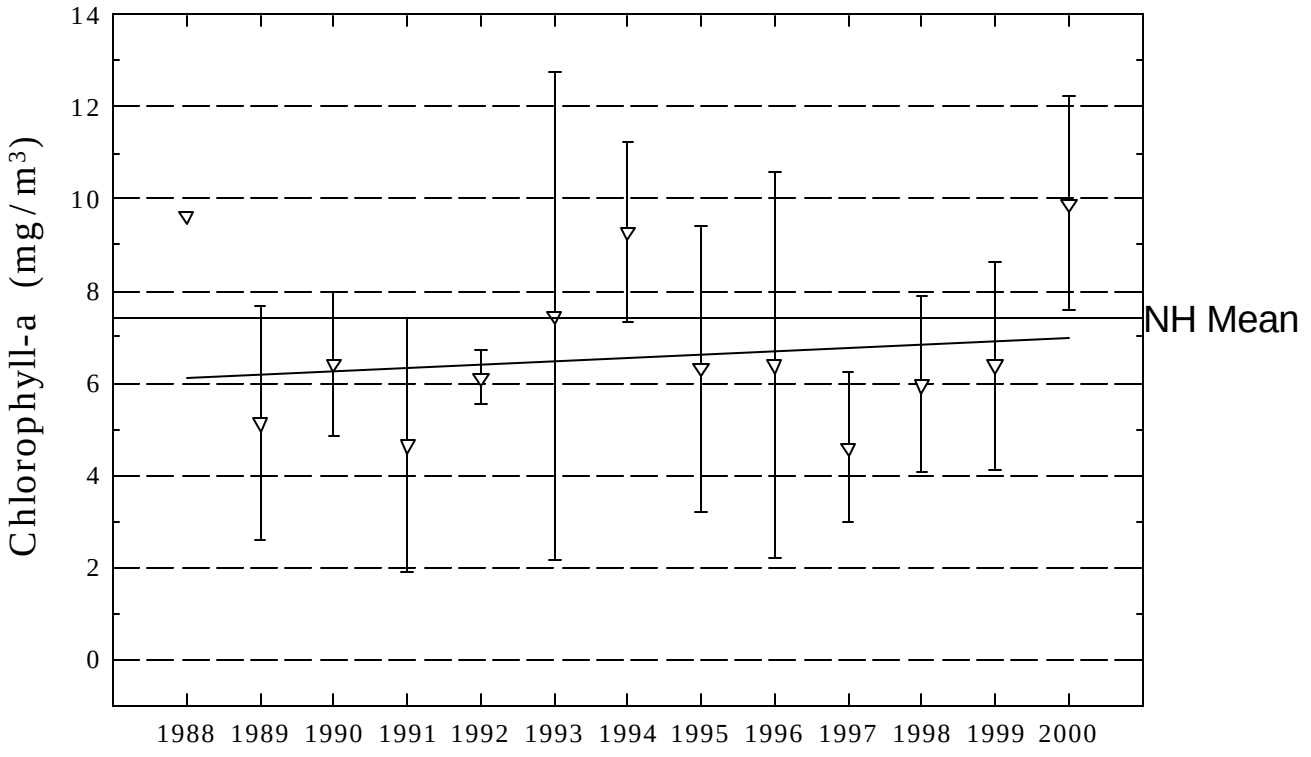
In Our Backyard. 1994. Terrence Institute, 4 Herbert St., Alexandria, VA. 22305, or call (800) 726-5253, or www.terrene.org

Island Pond, Stoddard

Figure 1. Monthly and Historical Chlorophyll-a Results



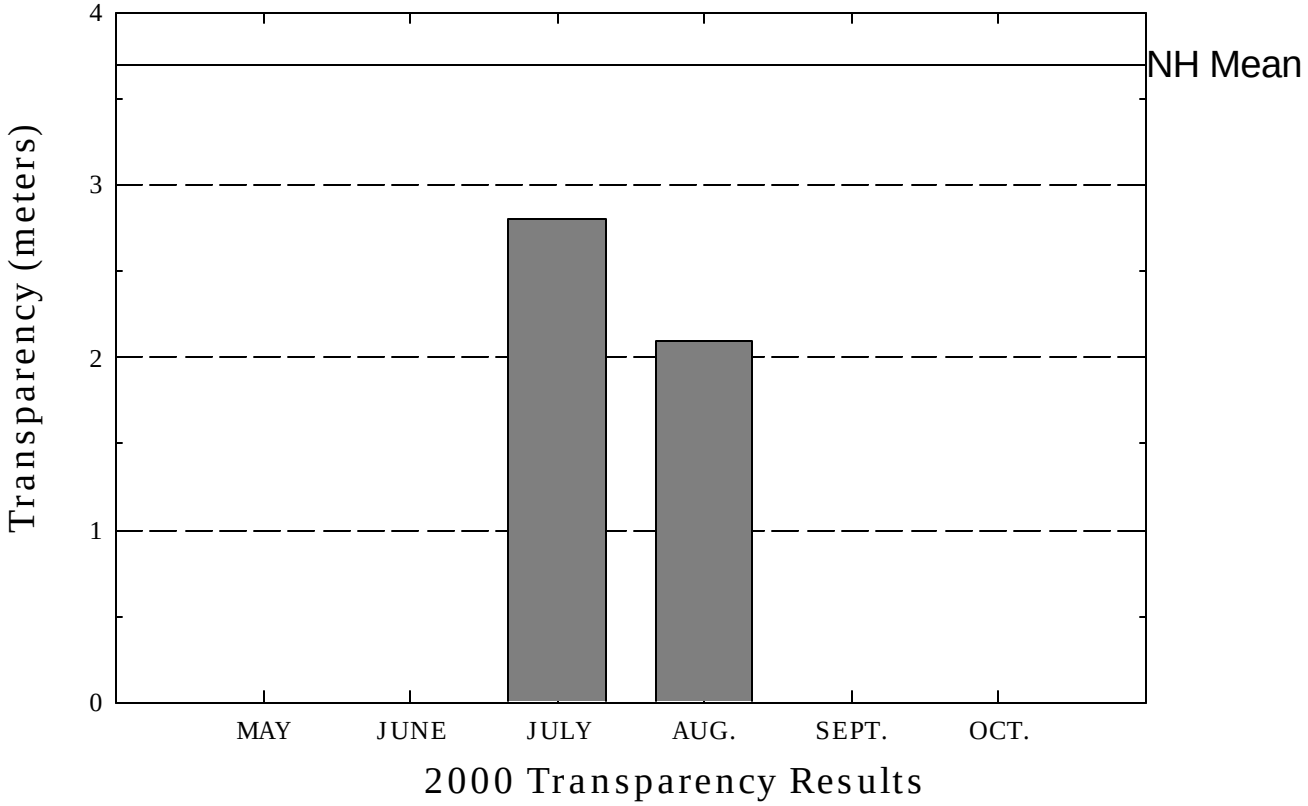
2000 Chlorophyll-a Results

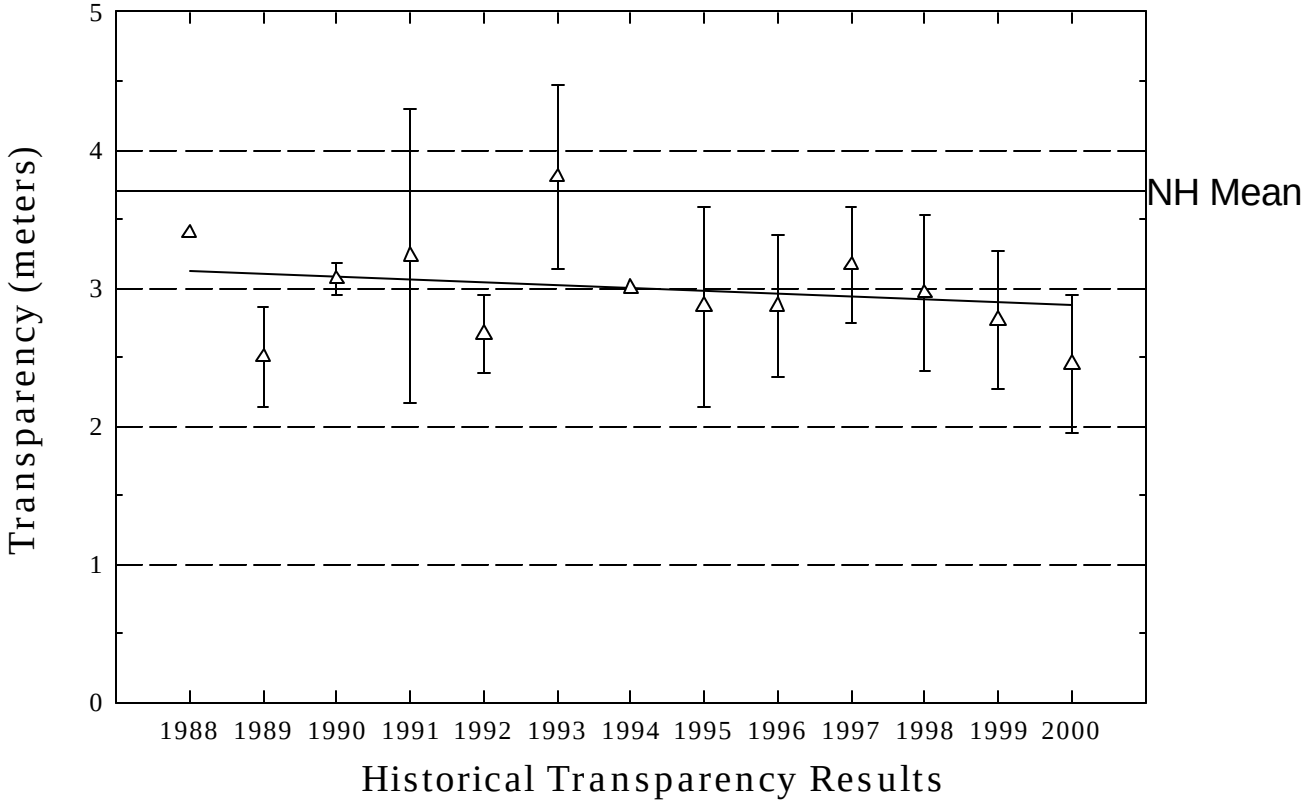


Historical Chlorophyll-a Results

Island Pond, Stoddard

Figure 2. Monthly and Historical Transparency Results





Island Pond, Stoddard

Figure 3. Monthly and Historical Total Phosphorus Data.

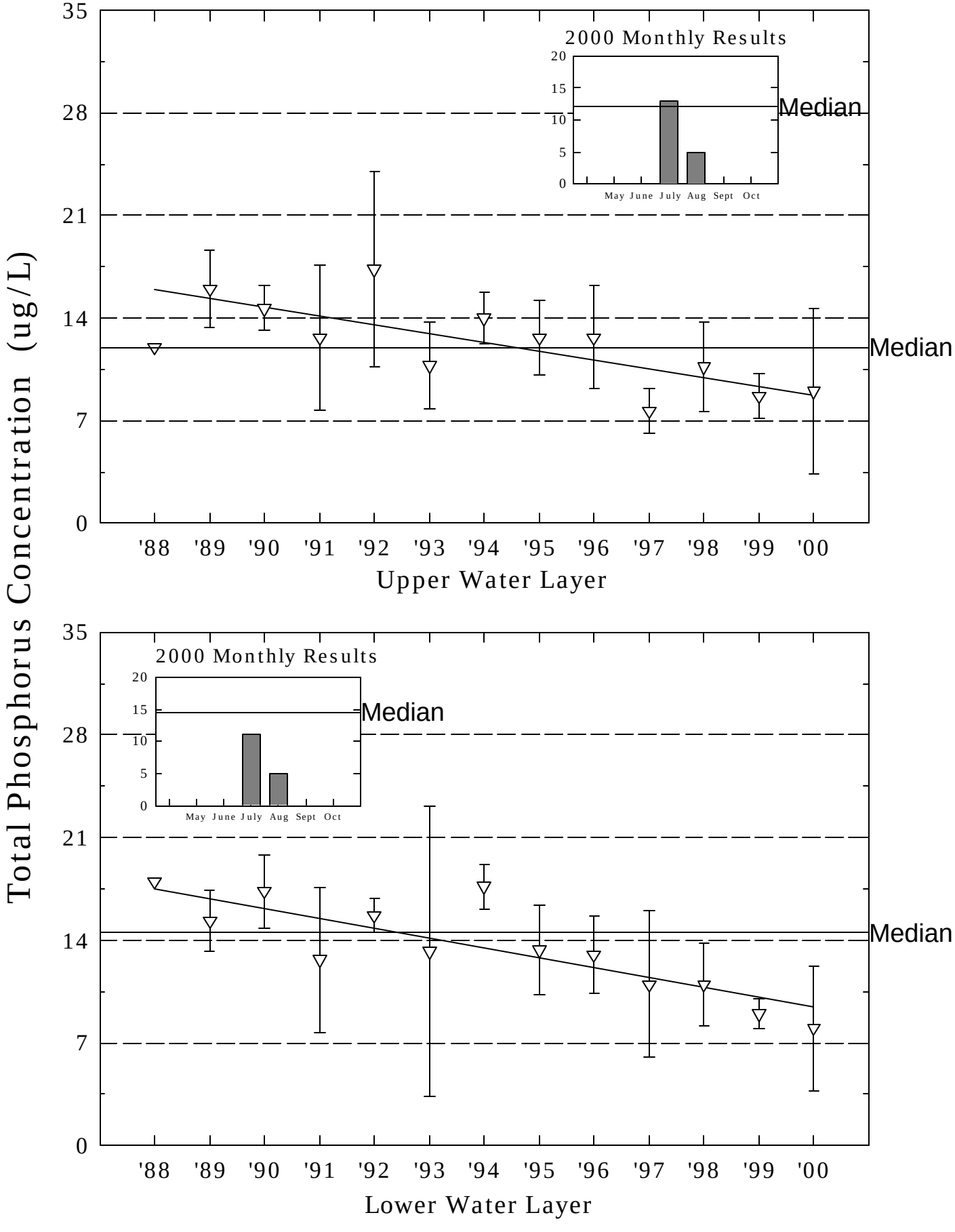


Table 1.

ISLAND POND
STODDARD

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1988	9.62	9.62	9.62
1989	2.22	6.81	5.12
1990	4.74	7.84	6.40
1991	1.81	7.28	4.65
1992	5.45	6.57	6.11
1993	3.27	15.05	7.45
1994	7.08	10.73	9.28
1995	2.72	8.22	6.31
1996	3.48	11.20	6.39
1997	2.73	5.77	4.59
1998	4.01	7.85	5.96
1999	3.82	8.06	6.38
2000	8.25	11.54	9.58

Table 2.

ISLAND POND
STODDARD

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07 / 21 / 1988	CHRYSOSPHAERELLA	43
	ASTERIONELLA	28
06 / 13 / 1989	MELOSIRA	33
07 / 10 / 1990	ASTERIONELLA	91
06 / 20 / 1991	ASTERIONELLA	82
06 / 10 / 1992	UROGLENOPSIS	48
	DINOBRYON	22
	ASTERIONELLA	7
06 / 30 / 1993	ASTERIONELLA	79
09 / 13 / 1993	MICROCYSTIS	52
07 / 25 / 1994	CHRYSOSPHAERELLA	55
	ASTERIONELLA	12
	TABELLARIA	10
06 / 12 / 1995	DINOBRYON	35
	ANABAENA	34
	ASTERIONELLA	8
07 / 16 / 1996	ASTERIONELLA	77
	STAURASTRUM	6
	MALLOMONAS	3
07 / 24 / 1997	RHIZOSOLENIA	14
	SYNEDRA	12
	DINOBRYON	15

Table 2.

ISLAND POND

STODDARD

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
08/27/1998	DINOBRYON	31
	MALLOMONAS	19
	PERIDINUM	18
08/23/1999	GLOEOTRICHIA	21
	TABELLARIA	17
	ANABAENA	10
08/21/2000	CHRYSOSPHAERELLA	89
	ASTERIONELLA	3
	PERIDINIUM	2

Table 3.

ISLAND POND

STODDARD

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1988	3.4	3.4	3.4
1989	2.2	2.9	2.5
1990	3.0	3.2	3.0
1991	2.3	4.4	3.2
1992	2.5	3.0	2.6
1993	2.9	4.5	3.8
1994	3.0	3.0	3.0
1995	2.4	3.7	2.8
1996	2.3	3.3	2.8
1997	2.7	3.5	3.1
1998	2.5	3.6	2.9
1999	2.3	3.3	2.7
2000	2.1	2.8	2.4

Table 4.

ISLAND POND

STODDARD

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1988	6.18	6.18	6.18
	1989	5.94	6.40	6.18
	1990	5.99	6.24	6.13
	1991	6.00	6.34	6.19
	1992	6.06	6.36	6.17
	1993	6.45	6.82	6.56
	1994	6.23	6.43	6.29
	1995	6.20	7.02	6.44
	1996	5.96	6.03	5.99
	1997	6.31	6.65	6.45
	1998	6.02	6.19	6.09
	1999	6.20	6.66	6.41
	2000	6.15	6.39	6.25
HYPOLIMNION				
	1988	6.25	6.25	6.25
	1989	5.94	6.31	6.14
	1990	5.65	6.22	5.87
	1991	5.90	6.11	6.03
	1992	5.86	6.06	5.97
	1993	5.85	6.55	6.17
	1994	5.76	6.04	5.89
	1995	6.17	6.43	6.32
	1996	5.53	5.74	5.65
	1997	6.06	6.47	6.26
	1998	5.80	5.88	5.83

Table 4.

ISLAND POND

STODDARD

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1999	6.23	6.49	6.33
	2000	6.12	6.19	6.15
INLET				
	1990	6.03	6.27	6.13
	1991	6.10	6.30	6.16
	1992	6.30	6.37	6.34
	1993	6.11	6.45	6.28
	1994	4.36	6.29	4.82
	1995	6.15	6.41	6.27
	1996	5.72	5.88	5.79
	1997	6.09	6.37	6.23
	1998	6.01	6.17	6.09
	1999	6.12	6.53	6.26
	2000	6.19	6.28	6.22
METALIMNION				
	1992	6.06	6.24	6.13
	1993	6.17	6.56	6.37
	1994	5.98	6.36	6.10
	1996	5.41	5.77	5.52
	1997	5.98	6.51	6.18
	1998	5.73	5.92	5.81
	1999	6.21	6.64	6.37
	2000	6.06	6.19	6.12
OLD ANTRIM BK #2				
	1989	5.29	5.29	5.29

Table 4.

ISLAND POND

STODDARD

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1990	5.40	5.40	5.40
OLD ANTRIM BK				
	1988	5.68	5.68	5.68
	1989	5.43	5.95	5.64
	1990	5.84	5.84	5.84
OUTLET				
	1988	6.25	6.25	6.25
	1989	5.88	6.39	6.14
	1990	6.02	6.34	6.15
	1991	6.10	6.30	6.19
	1992	6.26	6.39	6.34
	1993	6.23	6.54	6.40
	1994	6.16	6.29	6.21
	1995	6.07	6.44	6.19
	1996	5.68	5.91	5.76
	1997	6.10	6.61	6.29
	1998	6.10	6.34	6.18
	1999	6.27	6.54	6.38
	2000	6.18	6.33	6.25
SHED HILL BK				
	1988	6.25	6.25	6.25
	1989	5.97	6.49	6.16

Table 5.

ISLAND POND

STODDARD

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1988	2.10	2.10	2.10
1989	1.60	2.60	2.17
1990	1.60	2.10	1.77
1991	1.50	2.30	1.97
1992	0.90	2.20	1.70
1993	1.40	2.40	2.08
1994	1.70	3.10	2.47
1995	2.30	2.40	2.33
1996	1.80	2.70	2.30
1997	0.50	2.30	1.63
1998	1.60	2.20	1.93
1999	2.30	3.20	2.90
2000	1.90	12.90	5.70

Table 5.

ISLAND POND

STODDARD

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1988	2.10	2.10	2.10
1989	1.60	2.60	2.17
1990	1.60	2.10	1.77
1991	1.50	2.30	1.97
1992	0.90	2.20	1.70
1993	1.40	2.40	2.08
1994	1.70	3.10	2.47
1995	2.30	2.40	2.33
1996	1.80	2.70	2.30
1997	0.50	2.30	1.63
1998	1.60	2.20	1.93
1999	2.30	3.20	2.90
2000	1.90	12.90	5.70

Table 6.

ISLAND POND
STODDARD

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1988	29.1	29.1	29.1
	1989	32.7	34.1	33.5
	1990	28.4	32.0	30.8
	1991	28.8	31.7	30.3
	1992	33.3	33.3	33.3
	1993	32.6	34.8	33.6
	1994	31.9	32.3	32.1
	1995	32.3	34.1	33.3
	1996	29.2	31.7	30.6
	1997	30.3	31.1	30.6
	1998	29.0	30.5	29.9
	1999	33.3	34.8	34.2
	2000	30.5	31.6	31.2
HYPOLIMNION				
	1988	29.2	29.2	29.2
	1989	32.9	33.8	33.4
	1990	29.0	32.5	31.1
	1991	19.7	30.0	26.2
	1992	31.3	34.7	32.7
	1993	32.6	34.4	33.8
	1994	33.2	33.7	33.5
	1995	33.6	34.0	33.8
	1996	30.2	32.7	31.3
	1997	29.6	30.4	30.0

Table 6.

ISLAND POND
STODDARD

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
OLD ANTRIM BK #2				
	1989	23.8	23.8	23.8
	1990	19.1	19.1	19.1
OLD ANTRIM BK				
	1988	44.8	44.8	44.8
	1989	49.0	60.4	53.1
	1990	59.7	59.7	59.7
OUTLET				
	1988	28.8	28.8	28.8
	1989	32.3	34.6	33.6
	1990	29.3	32.5	31.2
	1991	29.8	33.6	31.1
	1992	33.2	35.0	34.0
	1993	31.9	33.9	32.9
	1994	30.8	32.8	31.7
	1995	32.7	35.8	34.1
	1996	29.5	32.8	30.9
	1997	29.9	30.5	30.2
	1998	29.3	30.0	29.7
	1999	33.8	34.2	33.9
	2000	30.5	31.5	31.2
SHED HILL BK				
	1988	28.1	28.1	28.1
	1989	31.8	32.4	32.1

Table 8.

ISLAND POND

STODDARD

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1988	12	12	12
	1989	14	19	16
	1990	13	16	14
	1991	7	16	12
	1992	13	25	17
	1993	8	15	10
	1994	12	15	14
	1995	10	15	12
	1996	9	16	12
	1997	6	9	7
	1998	8	14	10
	1999	7	10	8
	2000	< 5	13	9
HYPOLIMNION				
	1988	18	18	18
	1989	13	17	15
	1990	15	20	17
	1991	7	16	12
	1992	15	17	15
	1993	7	28	13
	1994	16	19	17
	1995	10	16	13
	1996	11	16	13
	1997	6	16	11

Table 6.

ISLAND POND
STODDARD

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1998	29.6	30.9	30.3
	1999	33.7	34.0	33.8
	2000	29.5	31.6	30.8
INLET				
	1990	28.2	32.5	30.3
	1991	28.1	32.2	29.8
	1992	30.6	32.3	31.6
	1993	31.0	35.3	32.7
	1994	31.3	53.7	39.7
	1995	32.8	35.8	34.2
	1996	28.9	32.9	30.3
	1997	28.6	30.2	29.4
	1998	27.8	29.0	28.5
	1999	33.9	35.1	34.3
	2000	29.0	31.1	30.2
METALIMNION				
	1992	26.2	34.2	31.2
	1993	32.0	35.9	33.8
	1994	31.7	32.4	32.0
	1996	29.6	31.6	30.5
	1997	30.0	30.9	30.5
	1998	29.1	29.9	29.5
	1999	33.4	34.4	33.9
	2000	31.2	31.7	31.5

Table 8.

ISLAND POND

STODDARD

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1998	9	13	11
	1999	8	10	9
	2000	< 5	11	9
INLET				
	1990	14	22	18
	1991	12	14	12
	1992	13	15	14
	1993	16	20	17
	1994	15	17	16
	1995	13	15	14
	1996	8	12	10
	1997	4	14	9
	1998	9	10	9
	1999	6	10	8
	2000	< 5	12	9
METALIMNION				
	1992	13	14	13
	1993	9	16	12
	1994	9	13	10
	1996	9	12	11
	1997	8	12	10
	1998	8	9	8
	1999	7	10	8
	2000	10	12	11

Table 8.

ISLAND POND

STODDARD

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
OLD ANTRIM BK #2				
	1989	17	17	17
	1990	23	23	23
OLD ANTRIM BK				
	1988	54	54	54
	1989	10	20	14
	1990	46	46	46
OUTLET				
	1988	11	11	11
	1989	12	25	17
	1990	10	17	13
	1991	10	11	10
	1992	9	12	10
	1993	7	8	7
	1994	6	11	9
	1995	8	15	12
	1996	8	13	9
	1997	5	11	8
	1998	5	10	7
	1999	1	11	6
	2000	5	10	6
SHED HILL BK				
	1988	18	18	18
	1989	21	21	21

Table 9.

ISLAND POND

STODDARD

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		August 21, 2000	
0.1	20.6	7.2	79.9
1.0	20.2	7.2	79.0
2.0	19.6	7.1	77.0
3.0	19.4	7.2	78.4
4.0	19.2	7.0	75.4
5.0	19.1	6.8	73.3

Table 10.

ISLAND POND

STODDARD

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
July 21, 1988	4.0	19.2	0.3	2.0
June 13, 1989	4.0	16.4	6.7	67.0
July 10, 1990	4.0	20.0	3.1	34.3
June 20, 1991	4.5	19.0	5.4	58.5
June 10, 1992	5.0	14.0	1.6	15.5
June 30, 1993	4.5	19.0	1.5	16.0
September 13, 1993	4.0	19.0	8.5	91.0
July 25, 1994	4.0	19.7	0.3	3.0
June 12, 1995	4.0	16.5	0.4	4.0
July 16, 1996	5.0	22.0	8.2	93.0
July 24, 1997	4.0	19.9	0.6	6.0
August 27, 1998	4.0	20.4	1.7	18.0
August 23, 1999	4.0	20.3	6.1	67.9
August 21, 2000	5.0	19.1	6.8	73.3

Table 11.

ISLAND POND
STODDARD

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	0.5	0.6	0.5
	1998	0.6	1.4	0.9
	1999	0.3	1.1	0.7
	2000	0.5	0.8	0.6
HYPOLIMNION				
	1997	0.4	0.6	0.5
	1998	0.9	1.0	1.0
	1999	0.5	0.8	0.6
	2000	0.6	0.7	0.6
INLET				
	1997	0.3	0.6	0.4
	1998	0.5	0.6	0.6
	1999	0.3	0.4	0.3
	2000	0.5	0.8	0.6
METALIMNION				
	1997	0.5	0.6	0.6
	1998	0.7	0.7	0.7
	1999	0.4	0.8	0.6
	2000	0.5	0.6	0.5
OUTLET				
	1997	0.4	0.5	0.4
	1998	0.4	0.5	0.5
	1999	0.3	0.6	0.4
	2000	0.3	0.8	0.6